Assessing Links Between Ecosystem Health and Childhood Asthma

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In collaboration with

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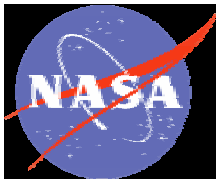
1. Design and development of tools for:

- integrating, visualizing, accessing, and analyzing

  - environmental, remotely sensed, and clinical health data

- providing information for public health decision support systems

  - appropriate medical regimen

  - when to take action to avoid exposure

  - where to target intervention and education
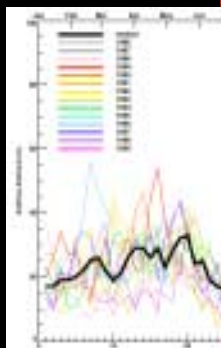
  - policy for long term changes

Design of Tools and Capabilities

1. Data Base Development

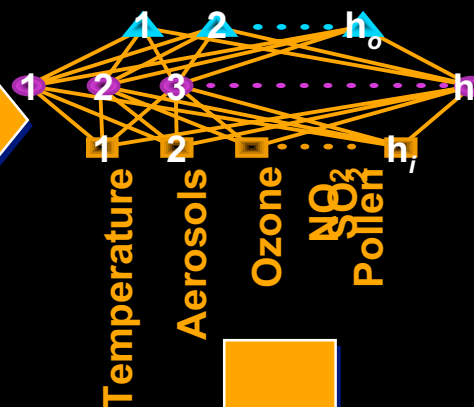**2.** GIS and Visualization

3. Modeling

Formatting, encapsulation

Manipulation, output

Temperature   Aerosols   Ozone NO_2 Pollen

4. Access to Knowledge

Data Base Components

Clinical data: HSCRC (hospitalizations and emergency room admissions with daily time step, zip code spatial level, age, gender, race), Medicaid, others

Socio-Economic: US census data, school data

Weather: precipitation, wind speed and direction, temperature, humidity, etc.

Air Quality: O_3, NO_2, CO, SO_2, air toxins, precursors to ozone, etc.

Water Quality: pharmaceuticals, pesticides, and other compounds

Environmental: pollen, molds, brownfields, soil properties, topography, ecoregions, agricultural activity, etc.

Remote Sensing: Landsat, AVHRR, Ikonos, SPOT, Aeronet, MODIS, ASTER, etc.

**Landmark features:** roads, cities, traffic, major industrial areas, etc.

2. Journal articles (5) and presentations reporting on:
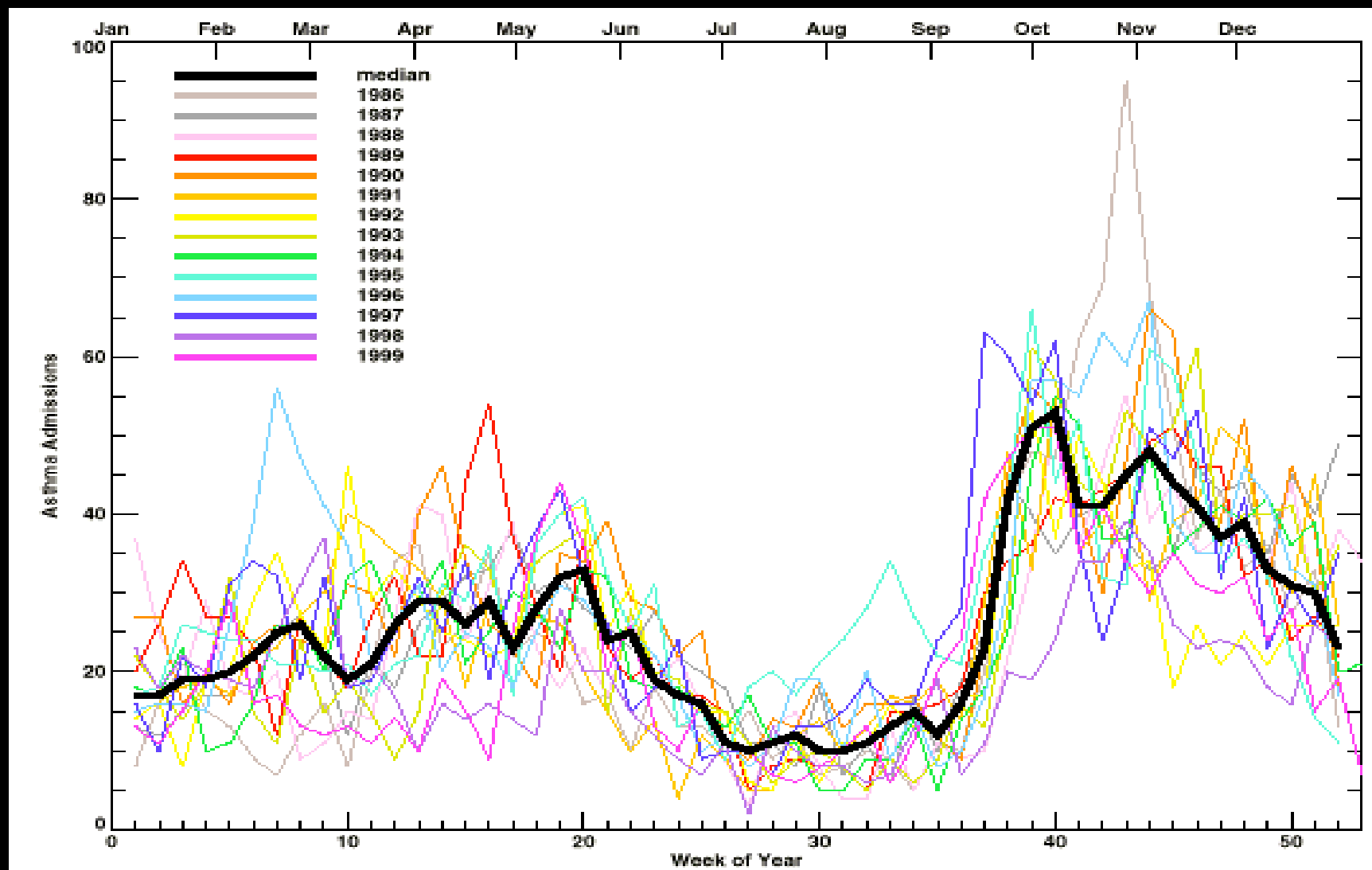
- Geographic and temporal distribution of pediatric asthma

- Detection and prediction of epidemics

- Identification of sensitive populations

- Preliminary analysis of effects of environmental factors on asthma incidence
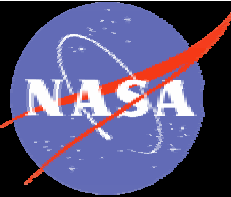
- Other information
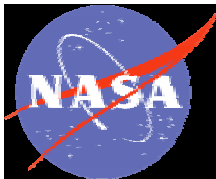
Temporal Data Application

Pediatric Asthma Hospital Admissions,1986-1999, Baltimore, MD

Blaisdell et al.Journal of Asthma, 2002; Kimes et al., Environmental Research, 2003

Temporal Data Application
Daily Ozone and Pediatric Hospital Admissions, 1999

Blaisdell et al. J. of Asthma, 2002; Kimes et al., Int. J. Neural Network Appl, 2003
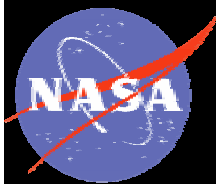
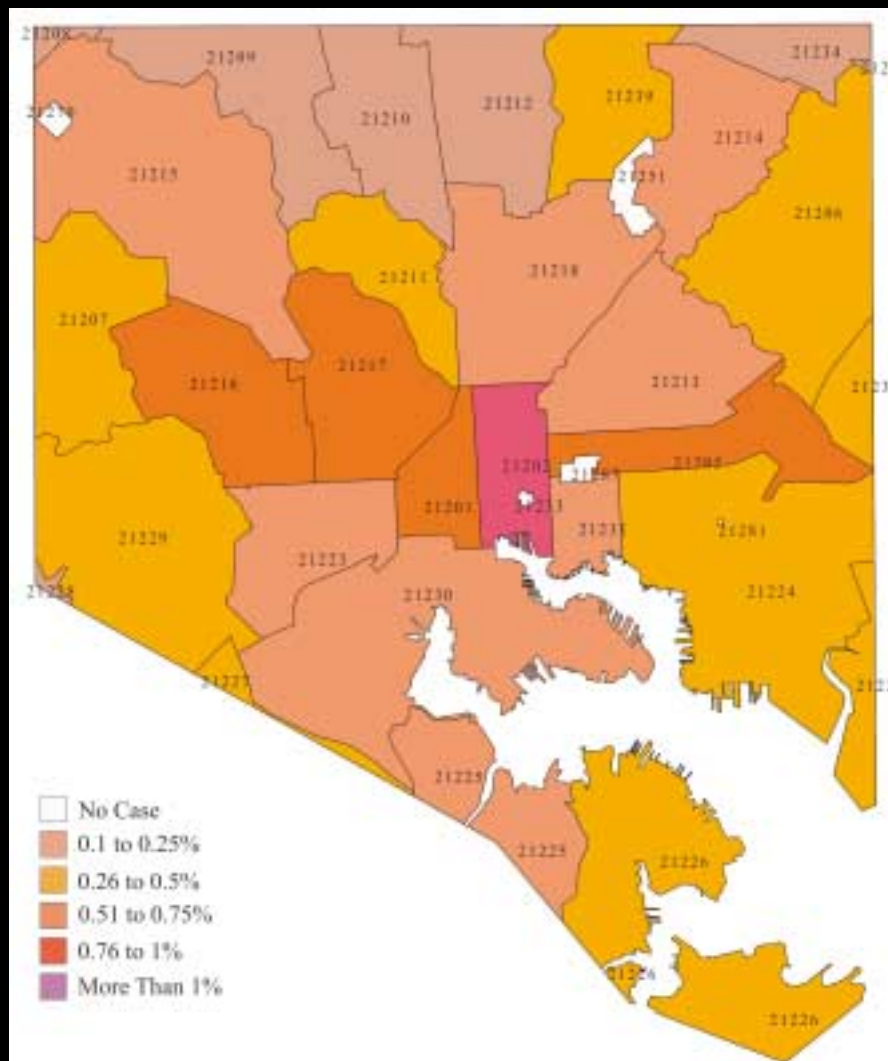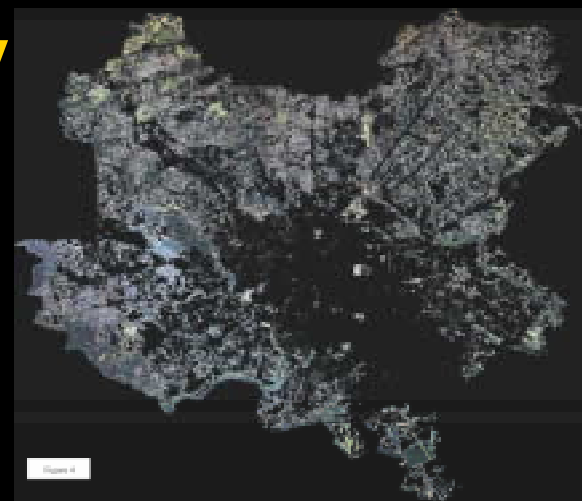# % Pediatric Hospitalization Rates by Zip Code, Baltimore, MD, 1999
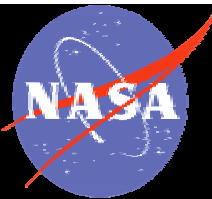
$R^2 = .95$

From Landsat:
- **Highest proportion of built areas**
- **Lowest vegetation cover**
- **Highest thermal IR radiant temperatures**
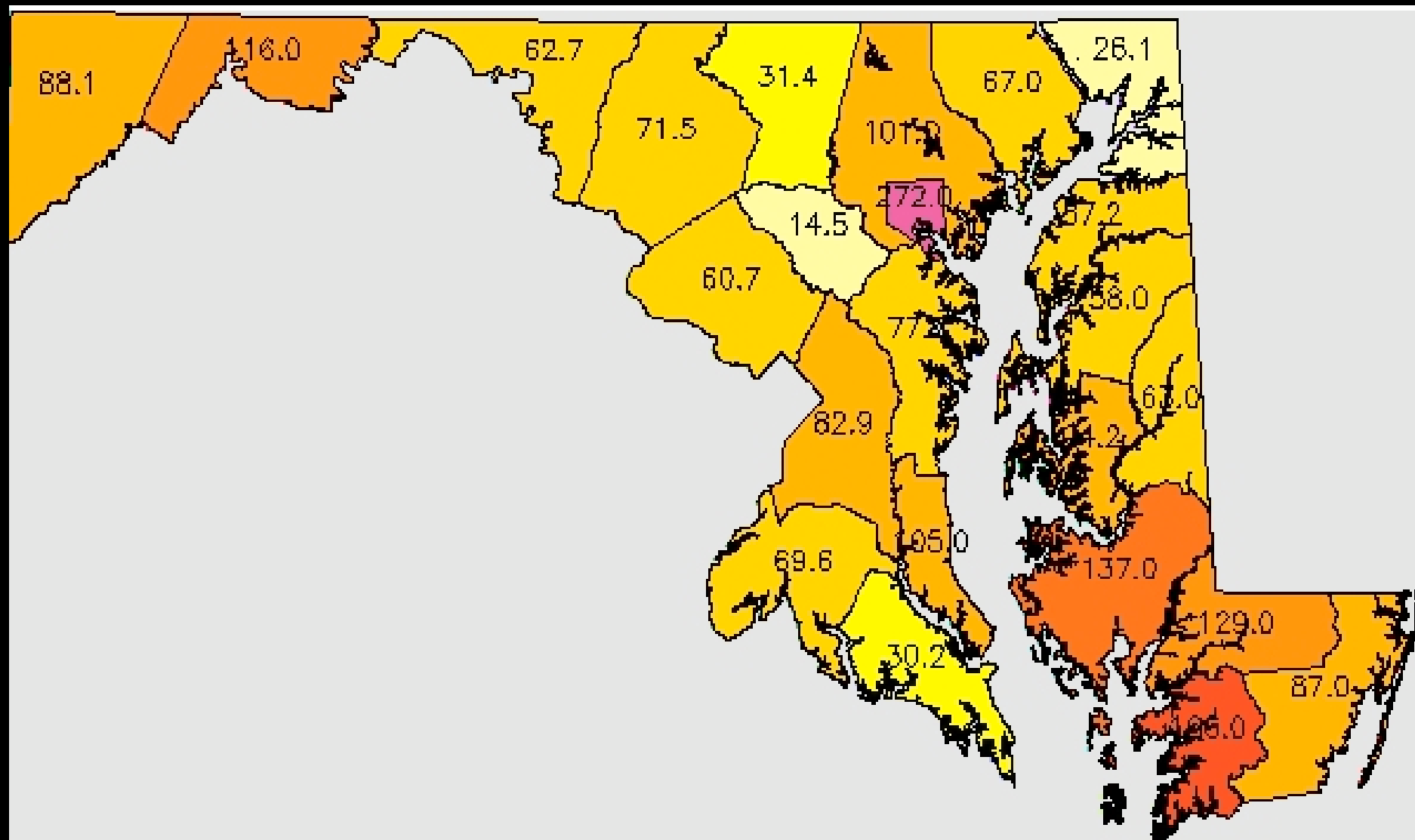
From Census:
- **Highest proportion of families headed by single parent**
- **Highest levels of poverty**

Kimes et al., Health and Place, 2004
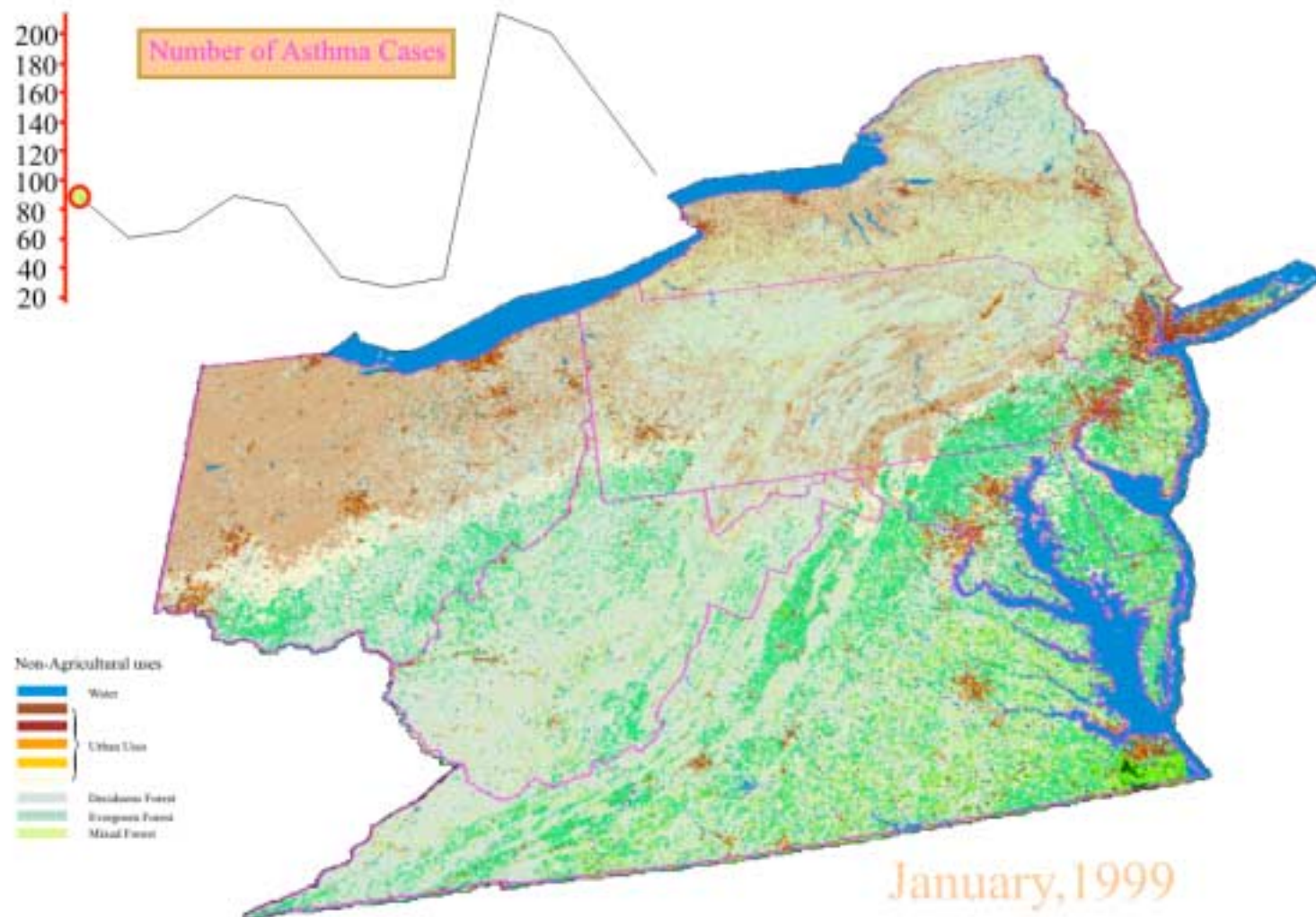
Example of Spatial Tools
Pediatric Asthma ED Admissions/10,000, 1999, MD Counties

NDVI Change for Agricultural Areas
SPOT (Veg) Data, 1999, 10 day composite

Baltimore Student Sun Photometer Network (BSSN)

Aeronet Sun Photometer, Maryland Science Center, Baltimore, Maryland

Summary

- **A set of** data analysis tools and capabilities **have been built for:**

  - Integration and analysis of clinical, remotely sensed, and environmental data

  - Decision support about asthma and other health issues at local, regional, and national scales

- **Clear** temporal and spatial trends of pediatric asthma hospitalizations have been identified which can be used to search for asthma triggers

- Accurate predictions **of pediatric asthma can be made using** remotely sensed, socioeconomic, and clinical data